BROADLY BENEFICIAL
CLEAN ENERGY PLANNING
Developing Processes, Indicators, Scenarios and Policies for Equitable And Inclusive Decarbonization

Session 2: Defining and modeling scenarios
Introductions – training team

Eric Mackres
WRI

Ted Wong
WRI

Lacey Shaver
WRI

Yeu-Rong Jih
Greenlink Analytics

Matt Cox
Greenlink Analytics

Kate Johnson
District of Columbia
Overall outline of training series

Session 1: Stage-setting and baseline data
- Concepts and methods for equity-focused planning
- Overview of scenario-based planning
- Choosing indicators
- Obtaining data to measure indicators

Session 2: Defining and modeling scenarios
- Interpreting and communicating baseline data
- Defining and modeling scenarios
- Evaluating scenarios

Session 3: Turning scenarios into policies
- Understanding scenario outcomes
- Identifying and prioritizing and policies and programs
- Preparing for implementation

Scenario Planning “test exercise” (Level 1 cities)
- Select indicators
- Review baseline
- Select scenarios
- Review scenario outcomes
Our theory of change

Information is power

scenario planning

• Partially frees process from biases & blindspots
• Promotes foresight, not forecasting
• Encourages cross-sector communication
• Structures iterative solution development

Values and voice provide direction

equity focus

• Diversity of voices produces larger solution-space
• Identifying and measuring what matters
• Broader inclusion and more equitable distribution of benefits
• More durable public and political support
Recap of Session 1

Equity and inclusive stakeholder engagement

Scenario planning

1. Assess the current situation
2. Choose variables for defining scenarios
3. Choose scenarios by exploring plausible combinations of the variables
4. Examine and evaluate scenarios

Selecting indicators and baseline data
## Components of Equitable Clean Energy Scenario Planning

<table>
<thead>
<tr>
<th>Planning component</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals</td>
<td>What are your government's and/or community's goals?</td>
</tr>
<tr>
<td>Process</td>
<td>How do you assure stakeholders are listened to?</td>
</tr>
<tr>
<td>Indicators</td>
<td>What are stakeholders' values and concerns?</td>
</tr>
<tr>
<td>Baseline</td>
<td>Where are you now?</td>
</tr>
<tr>
<td>Scenarios</td>
<td>What are your possible pathways?</td>
</tr>
<tr>
<td></td>
<td>• What actions do you want to consider?</td>
</tr>
<tr>
<td></td>
<td>• How do you design them equitably?</td>
</tr>
<tr>
<td>Impacts</td>
<td>What are the likely outcomes?</td>
</tr>
<tr>
<td>Policies and programs</td>
<td>How do you design and implement the actions?</td>
</tr>
<tr>
<td>Distributional design</td>
<td>Who benefits? Who pays?</td>
</tr>
</tbody>
</table>
Objectives for today

By the end of today’s session, you should...

• Feel comfortable interpreting and communicating your baseline indicator data

• Understand the process of defining energy-policy scenarios through an inclusive stakeholder-driven process

• Be familiar with scenario modeling methods

• Be ready to develop scenarios for your community
Agenda

Core session – 1.5 hours
1. Communicating baseline data
2. Interpreting your baseline - discussion
3. Developing scenarios
4. Modeling scenarios
5. Case study: using scenarios for stakeholder engagement – District of Columbia
6. Using the Scenario Calculator
7. Wrap-up & homework

Optional Q & A and discussion – 30 minutes
Communicating baseline data
Example indicators that might be used in a baseline

**Demographics**
- Population
- Racial composition
- Educational attainment
- Median age

**Housing characteristics**
- Average household size
- Households with children
- Number of bedrooms
- Eviction rates
- House heating fuel (gas, electricity, renewables, etc.)
- Mortgage status
- Median property value
- Percent of renters in a geography
- Housing type, rented or owned (single family detached, multifamily, townhouse, etc.)

**Transportation characteristics**
- Means of transportation
- Travel time to work
- Average commute to work (in minutes)

**Income characteristics**
- Gini index of income inequality
- Poverty status
- Number of individuals utilizing the Supplemental Nutrition Assistance Program
- Households with living costs exceeding 30% of their income

**Health characteristics (for select cities)**
- Prevalence of arthritis
- Prevalence of asthma
- Prevalence of binge drinking
- Prevalence of cancer (except skin cancer)
- Prevalence of cholesterol screening
- Prevalence of chronic obstructive pulmonary disease
- Prevalence of colonoscopy and/or sigmoidoscopy
- Prevalence of coronary heart disease
- Prevalence of current lack of health insurance
- Prevalence of diabetes
- Prevalence of high blood pressure
- Prevalence of high cholesterol
- Prevalence of kidney disease
- Prevalence of no leisure time physical activity
- Prevalence of loss of teeth
- Prevalence of mammography use
- Prevalence of mental health of not good for equal to or greater than 14 days
- Prevalence of obesity
- Prevalence of PAP smear use
- Prevalence of poor physical health
- Prevalence of sleeping less than 7 hours
- Prevalence of smoking
- Prevalence of stroke
- Prevalence of taking medication for high blood pressure
- Prevalence of visits to the dentist
- Prevalence of visits to doctors for routine checkups within the past year

https://greenlinkanalytics.org
The baseline's role includes information and communication

Illuminate assets, opportunities, and current status of stakeholder-relevant indicators

Validate and/or challenge stakeholders' perceptions of community inequity

Establish common reference points for discussion

Facilitate agreement on shared goals
Tips for turning data into discussion

Goal is to move from specific (e.g., indicators) to general (e.g., scenarios)

Start with unstructured discussion of the baseline indicators

- Start with one indicator at a time
- Do they make sense?
- Which indicators look good/bad?
- What would be the ideal situation?
- Which indicators are more/less important?

Make things vivid

- Use many types of data visualization
- Use narratives
- Invite stakeholders to share their personal perspectives
Baseline report: key content and audiences

**Energy profile report**
- Executive summary
- Stakeholder engagement process
- Energy vision
- Energy profile
  - Key facts
  - Current energy use and cost
  - Projected future energy use and cost
  - Related efforts underway in the community
- Gaps and challenges
- Next process steps

Communicating numerical info is all about converting numbers into familiar things

Interpreting your baseline
Which indicators are most important to your community? (Check the two you most wanted to see mapped)

**Demographics**
- Population
- Racial composition
- Educational attainment
- Median age

**Housing characteristics**
- Average household size
- Households with children
- Number of bedrooms
- Eviction rates
- House heating fuel (gas, electricity, renewables, etc.)
- Mortgage status
- Median property value
- Percent of renters in a geography
- Housing type, rented or owned (single family detached, multifamily, townhouse, etc.)

**Transportation characteristics**
- Means of transportation
- Travel time to work
- Average commute to work (in minutes)

**Income characteristics**
- Gini index of income inequality
- Poverty status
- Number of individuals utilizing the Supplemental Nutrition Assistance Program
- Households with living costs exceeding 30% of their income

**Health characteristics (for select cities)**
- Prevalence of arthritis
- Prevalence of asthma
- Prevalence of binge drinking
- Prevalence of cancer (except skin cancer)
- Prevalence of cholesterol screening
- Prevalence of chronic obstructive pulmonary disease
- Prevalence of colonoscopy and/or sigmoidoscopy
- Prevalence of coronary heart disease
- Prevalence of current lack of health insurance
- Prevalence of diabetes
- Prevalence of high blood pressure
- Prevalence of high cholesterol
- Prevalence of kidney disease
- Prevalence of no leisure time physical activity
- Prevalence of loss of teeth
- Prevalence of mammography use
- Prevalence of mental health of not good for equal to or greater than 14 days
- Prevalence of obesity
- Prevalence of PAP smear use
- Prevalence of poor physical health
- Prevalence of sleeping less than 7 hours
- Prevalence of smoking
- Prevalence of stroke
- Prevalence of taking medication for high blood pressure
- Prevalence of visits to the dentist
- Prevalence of visits to doctors for routine checkups within the past year

https://greenlinkanalytics.org
Discussion: Indicator selection

Why did you choose the indicators you did?

Are there any that you would have chosen, but they weren’t on the list?
Baseline energy equity indicator maps - Example: Las Cruces' energy burden, heating fuel, housing structure

Source: Greenlink Analytics, published on Tableau. Plus maps for all 12 Level 1 cities.
Discussion: Baseline results

What did you learn from your baseline indicators and maps?

What might you do differently as a result of this information?

How might you use this information to engage and communicate with stakeholders?
Developing scenarios
Scenarios as possible futures

Baseline

Range of numerous possible futures

Source: Coalition for Urban Transitions, Climate Emergency, Urban Opportunity, 2019
Scenarios are a combination of actions

Baseline

Possible mixes of action options

Possible future outcomes
What level of detail? Identifying available actions

Renewable energy policies and programs from C40, [https://www.c40.org/researches/c40-cities-the-power-to-act](https://www.c40.org/researches/c40-cities-the-power-to-act)

**LEVELS**

- **action categories**
  - Energy supply
  - Energy efficiency
  - Transportation

- **policies and programs**
  - Solar photovoltaics
  - Cogeneration
  - Waste-to-energy
  - Community solar
  - On-site solar
  - Physical PPA
  - Virtual PPA
  - Green tariff

**EXAMPLES**

**abstract**

**concrete**

(Listing actions for energy supply)

(Listing actions for renewable energy)
Scenario development: action-spaces

- High investment in renewables:
  - High efficiency
  - Low renewables

- Low investment in renewables:
  - Low efficiency
  - Low renewables
  - High renewables

- High efficiency:
  - High renewables
  - Low renewables

- Low efficiency:
  - High renewables

- Good if you have 1-2 actions
- Good if you have many actions, but they cluster in their societal effects
- Easy to think about
- Easy to communicate
Scenario 1 (15 year trend)

- Population and employment follow a trend seen over the past 15 years
- Primarily low density development
- People live in the suburbs and work in the central city
- Consistent with current land use plans and policies

Scenario 2 (5 year trend)

- Follows recent (past 5 years) trend
- For Bexar County this is infill development that is primarily medium- to higher-density and supports increased use of alternative modes of transportation
- For Comal, Guadalupe and Kendall counties this shows development patterns similar to the 15 year trend

Scenario 3 (Activity Centers/Corridors)

- Population and employment growth occurs at activity centers and key transportation corridors
- Produces highest density of the three scenarios
- Results in people living closer to where they work
- Increases active transportation modes and transit use

**Scenario development: action combinations**

*If you have more than two actions, use check-box matrices or slider panels.*

*The idea is to keep things visual.*

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Action 2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Action 3</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Action 4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Action 5</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

**Action 1**
- LOW

**Action 2**
- HIGH

**Action 3**
- HIGH

**Action 4**
- MEDIUM
### Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing buildings renovated for efficiency</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>New buildings more efficient</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>District heat in high-density areas, powered by 70 MW CCGT</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>District heat in industrial park, powered by 30 MW CHP</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Increased vehicle efficiency; 7% EV</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>24 MW photovoltaic installation</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>20 MW biomass facility, partially replacing coal</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% biogas blend for CHP and (if used) CCGT</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>37 MW wind</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 MW biomass/coal facility</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

How many scenarios?

Have a business-as-usual (BAU) scenario and at least two that reflect active changes. More is OK, but try to use as few as possible.

The scenarios should be different enough from each other that the public can easily differentiate them.

All active-change scenarios should be improvements over BAU.
How far will our money take us?

• Your goals should drive your scenarios, not costs
  • Scenario outcomes will help you shape the conversation on costs and benefits next, and budget and finance later
• More equitable scenarios may require more upfront investment, because more people receiving more kinds of benefits.
• “Cost-effectiveness” – aim for more inclusive definitions
  • Financial return on investment
  • Monetized externalities (social cost of carbon) integrated into cost test – “societal benefit”
  • [Metric] / $ invested – GHG emissions reduction, % income saved through reduced energy burden
Who is impacted? Distributional parameters

- *Who* is impacted by actions is just as important as the kinds of actions selected.
  - Costs – who pays?
  - Direct benefits – who sees financial (e.g. bill savings) and non-financial benefits (e.g. home comfort and indoor health) from action
  - Indirect benefits – jobs created, increased local investment, outdoor air quality, etc.

- If you have equity indicators and objectives, select scenario parameters and modeling tools that can influence and assess distributional impacts:
  - Geography
  - Race
  - Income
  - Other frontline or vulnerability categories

- Include explicit distributional parameters in action design:
  - First-come-first-served
  - Geographic targeting
  - Means-tested
  - Performance/outcome-based – GHG reduction, energy cost burden reduction
## Distributional design of scenarios – metrics matter

<table>
<thead>
<tr>
<th>Action design type</th>
<th><strong>TRADITIONAL</strong></th>
<th><strong>EQUALITY-FOCUSED</strong></th>
<th><strong>EQUITY-FOCUSED</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Example metrics used to prioritize action delivery</td>
<td>High energy consumption</td>
<td>Population distribution</td>
<td>High energy burden</td>
</tr>
<tr>
<td>Example programs</td>
<td>Utility appliance rebates</td>
<td>Programs with equal budget per city ward</td>
<td>Weatherization Assistance Program</td>
</tr>
</tbody>
</table>
Example: poverty reduction in Chicago

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing poverty by 25% would bring people out of poverty</td>
<td>116,350 poverty reduction goal.</td>
</tr>
</tbody>
</table>

Source: CNT, Urban Opportunity Agenda calculator [https://uoa.cnt.org/]
Modeling scenarios
Models take you from baseline to potential futures
**Some free modeling tools**

<table>
<thead>
<tr>
<th>Tool</th>
<th>Provider</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided Emissions and Generation Tool (AVERT)</td>
<td>EPA</td>
<td>Estimates pollution and GHG impacts of energy-efficiency and renewable-energy policies. State, city, or zip-code level.</td>
</tr>
<tr>
<td>Benefits Mapping and Analysis Program (BenMAP)</td>
<td>EPA</td>
<td>Estimates pollution-related deaths and illness, and associated economic costs, from air-quality data. Resolution same as CMAQ data, but can be aggregated to larger units.</td>
</tr>
<tr>
<td>Co-benefits Risk Assessment Health Impacts Screening and Mapping (COBRA)</td>
<td>EPA</td>
<td>Estimates pollution-related deaths and illness, and associated economic costs, avoided for energy-efficiency and renewable-energy policies. County, state, regional, or national.</td>
</tr>
<tr>
<td>Climate Action for Urban Sustainability (CURB)</td>
<td>C40, World Bank</td>
<td>Estimates GHG emissions from energy-consumption and waste-production data. (Downscaled default inputs are provided.) Estimates emission reduction from selected policies. City level.</td>
</tr>
<tr>
<td>Grid Project Impact Quantification Screening Tool (GridPIQ)</td>
<td>Pacific Northwest National Laboratory</td>
<td>Projects impacts of grid projects that change load profile. Impacts include emissions, and peak characteristics and other changes to load dynamics.</td>
</tr>
<tr>
<td>Economic Tool for Rapid Assessment of City Energy (TRACE)</td>
<td>World Bank</td>
<td>Estimate cost and energy savings and avoided emissions from a variety of GHG emission-reduction actions.</td>
</tr>
</tbody>
</table>
Choosing modeling tools is all about inputs and outputs

The big-picture goal is to show how each set of actions leads to a different future—*but all the modeling options can be confusing.*

The trick is to look at one tool at a time, and to think of each in terms of its inputs and outputs...
Think of models as inputs becoming outputs

COBRA

EMISSION-REDUCTION ACTIONS

PUBLIC HEALTH IMPACTS

- Electricity-efficiency goal
- Natural gas-efficiency goal
- VMT goal

Source: Minneapolis Climate Action Plan

<table>
<thead>
<tr>
<th>2017 statewide impacts of Minneapolis Climate Action Plan goals: EPA-COBRA estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity efficiency goal</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Adult mortality</td>
</tr>
<tr>
<td>Infant mortality</td>
</tr>
<tr>
<td>Non-fatal heart attacks</td>
</tr>
<tr>
<td>Asthma E.R. visits</td>
</tr>
<tr>
<td>Work loss days</td>
</tr>
<tr>
<td>Asthma exacerbations</td>
</tr>
</tbody>
</table>

Total savings

- $3.5 - $8.9 million
- $509 - $1,299
- $1.0 - $3.7 million
## Models have different strengths and requirements

<table>
<thead>
<tr>
<th>What it is</th>
<th>What it requires</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>Underlying logic applies in many places and situations</td>
<td>Willingness to make assumptions and interpretations</td>
</tr>
<tr>
<td><strong>Realistic</strong></td>
<td></td>
</tr>
<tr>
<td>Underlying logic reflects actual causes and effects driving the modeled phenomenon</td>
<td>Contextual info regarding local dynamics and interactions</td>
</tr>
<tr>
<td><strong>Precise</strong></td>
<td></td>
</tr>
<tr>
<td>Model makes specific, numerical predictions</td>
<td>Precise, accurate baseline data</td>
</tr>
</tbody>
</table>
Models can be two but not all three

- Demographic models
- Machine-learning models
- IMHE COVID-19 model (a curve-fitting model)

- Local weather models
- Regional climate models
- Hydrological models

- Economic models
- Climate-vulnerability models
- Imperial College COVID-19 model (an agent-based simulation)
Generalism and realism are most useful for scenario planning

Precise is nice, but...

- Hard to get good input data
- The future is unpredictable
- Direction and rough magnitude of change is often sufficient
Predicting direction and rough magnitude of change can be sufficient

<table>
<thead>
<tr>
<th>Health Outcome/ Determinant</th>
<th>Impact (Direction and Extent)</th>
<th>Likelihood</th>
<th>Distribution</th>
<th>Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buildings and Energy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity, diabetes and other chronic diseases</td>
<td>▼</td>
<td>Possible</td>
<td>Low-income residents impacted more</td>
<td>*</td>
</tr>
<tr>
<td>Respiratory and cardiovascular diseases and hospitalizations</td>
<td>▼▼▼</td>
<td>Likely</td>
<td>Residents living in the pathway of power plants impacted more</td>
<td>+++</td>
</tr>
<tr>
<td>Negative health outcomes of contaminated surface water and drinking water</td>
<td>▼</td>
<td>Possible</td>
<td>Residents living near power plants impacted more</td>
<td>=</td>
</tr>
<tr>
<td>Mental health</td>
<td>▲</td>
<td>Possible</td>
<td>Low-income residents impacted more</td>
<td>=</td>
</tr>
<tr>
<td><strong>Transportation and Land Use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory and cardiovascular diseases and hospitalizations</td>
<td>▼▼▼▼</td>
<td>Likely</td>
<td>Residents located near major roads impacted more</td>
<td>+++</td>
</tr>
<tr>
<td>Obesity, diabetes and other chronic diseases</td>
<td>▼▼▼</td>
<td>Likely</td>
<td>Residents using non-auto mode share impacted more</td>
<td>++</td>
</tr>
<tr>
<td>Mental health</td>
<td>▼▼</td>
<td>Possible</td>
<td>Residents using non-auto mode share impacted more</td>
<td>=</td>
</tr>
<tr>
<td>Neighborhood safety</td>
<td>▼▼ ▼</td>
<td>Possible</td>
<td>Residents of livable, walkable neighborhood impacted more</td>
<td>=</td>
</tr>
<tr>
<td><strong>Waste and Recycling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory and cardiovascular diseases and hospitalizations</td>
<td>▼▼</td>
<td>Possible</td>
<td>Residents living in the pathway of landfills or power plants impacted more</td>
<td>**</td>
</tr>
<tr>
<td>Waterborne disease outbreaks and health outcomes of contaminated surface and drinking water</td>
<td>▼▼</td>
<td>Possible</td>
<td>Residents living near landfills impacted more</td>
<td>=</td>
</tr>
</tbody>
</table>
Generality and realism both require stakeholder participation

General models

Willingness to make assumptions and interpretations

Stakeholders’ comfort with simplifications and inferences

Realistic models

Contextual info regarding local dynamics and interactions

Stakeholders’ perspectives and expertise
Some questions to ask when evaluating modeling tools

Can I get the inputs? Can I use the outputs?

Does it provide default data? Is it easy to customize?

How granular is it? How granular do I really need?

Do I understand the underlying logic? Can I explain it?

How current is it? Is it on a regular update schedule? Will it be available in five years?

Does the provider provide live support?
Models are not everything

All models are wrong, but some are useful.

– George Box
Discussion: Developing & modeling scenarios

What challenges with developing or modeling scenarios have you encountered or do you anticipate encountering?
Case study – Using Scenarios for Stakeholder Engagement
Carbon Free DC 2050

Kate Johnson
Chief, Green Building & Climate Branch
Urban Sustainability Administration
Department of Energy & Environment
Pathways Toward a Safe, Equitable, Livable, Accessible, Prosperous, Healthy, Resilient + Zero Carbon DC
Current Emissions

7.3M tons of carbon (2017)
A Next Step in City Planning

2013 Sustainable DC
Envisioned a 20 year citywide plan for sustainability

2014 moveDC
Set a 25 year vision for the District’s transportation system

2016 Climate Ready DC
Identified resilience strategies to address key climate risks

2018 Clean Energy DC
Outlined a roadmap to achieve 50% GHG reduction by 2032

2019 SDC DC 2.0
Updated the 2013 plan, recommitting to innovative and inclusive ways to meet sustainability goals by 2032

2020 Net-Zero Carbon Strategy
Will chart the District’s pathway to become carbon neutral by 2050

COMING SOON!
A Community Vision

In 2050, all District residents...

• Have a home to live in that is healthy, safe, and affordable to keep comfortable;

• Get around using convenient, reliable, safe, affordable transportation options;

• Can meet their daily needs within an easy walk/roll of their home;

• Participate in and benefit from a green economy and green jobs;

• Are prepared for the impacts of climate change and have the tools to live green
How Do We Get There?
Our Approach

The community tells us what goals we’re solving for.

The technical assessment tells us what systems we must change.

The community identifies what we’ll need to tackle in order to meet these targets.

And the policy roadmap will identify what we need from policies to meet both our carbon and equity goals.
Accelerated path to carbon neutrality

GHG Emissions (MMT CO₂-e)

- Current trajectory with existing policies
- Gradual path to carbon neutrality
- Accelerated path to carbon neutrality
- Savings in cumulative GHG emissions with accelerated scenario

89% reduction from 2006
Key Milestones

2026: Net-zero energy construction for new homes & buildings

2030: 70% of organic waste from homes & businesses is composted

2032: 75% of commute trips are made without a car

2035: Replacement heat & hot water systems are all electric

2040: 70% of existing homes are all-electric

2045: All new cars registered in the District are electric
Equity & Community Priorities

- Health & Wellbeing
- Safety
- Affordability
- Jobs & Economic Development
- Access

Equity & Resilience Evaluation Criteria

- Extreme Heat
- Extreme Weather
- Flooding & Sea Level Rise
- Air Quality
- Safety
Questions?
Using the Scenario Calculator
Our “test exercise” scenario calculator tool

### Energy Pathways for Miami Florida

**About the Tool**
This tool allows you to design energy pathways in Miami Florida. It covers outcomes of energy efficiency and solar investments within the residential and commercial sector. This tool is powered by Greenlink Analytics trusted professional knowledge, using industry wide assumptions and sample outputs created by Greenlink’s ATHENIA model.

**How to use**
You can create your own energy future by inputting the values in the 'ACTION' cells. After entering your target values, your report card will give a deeper breakdown of the impact.

<table>
<thead>
<tr>
<th>Energy Efficiency</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Potential Achieved</td>
<td>100%</td>
</tr>
<tr>
<td>Commercial Potential Achieved</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solar Power</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Solar Power</td>
<td>100%</td>
</tr>
<tr>
<td>Commercial Solar Power</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Your 2030 Pathway Report Card**

<table>
<thead>
<tr>
<th>Cost Overview</th>
<th>2030 Clean Energy Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Investment</td>
<td>$3,690,000,000</td>
</tr>
<tr>
<td>Net Benefits (SM)</td>
<td>$1,521,000,000</td>
</tr>
<tr>
<td>Benefit Cost Ratio</td>
<td>0.4</td>
</tr>
<tr>
<td>Net Jobs Created</td>
<td>33,100</td>
</tr>
<tr>
<td>Energy Demand Met by Efficiency</td>
<td>28%</td>
</tr>
<tr>
<td>Residential Solar Capacity Installed (MW)</td>
<td>17</td>
</tr>
<tr>
<td>Commercial Solar Capacity Installed (MW)</td>
<td>6</td>
</tr>
<tr>
<td>Avoided Climate Damages ($)</td>
<td>$1,042,000,000</td>
</tr>
<tr>
<td>Metric Tons CO₂ Avoided (2021-2030)</td>
<td>18,855,000</td>
</tr>
</tbody>
</table>

Source: Greenlink Analytics. Links to scenario calculators for all 12 Level 1 cities here.
Wrap-up
Homework

(all participants)

1. **Share your feedback on this session** (5 minutes) –
   • respond to the poll at [https://bit.ly/broadly_feedback_2](https://bit.ly/broadly_feedback_2)

2. We will send custom city **scenario calculators** this week (one for each Level 1 city). **Use one calculator (your city’s, or one for a city a similar to yours) to explore different scenario options and their impacts.** Based on your explorations, choose:
   • *One distributional program design for residential efficiency* – Business-as-usual vs additional low-income investments
   • *The level of potential achieved* (0-100%) for *four intervention types*
     • Residential energy efficiency
     • Commercial energy efficiency
     • Residential solar
     • Commercial solar
Homework

(Level 1 participants only)

3. Choose an intervention scenario and indicate your chosen variables in your scenario calculator. Email a copy of the calculator tool (with your settings saved) or a screenshot of it to Yeou Jih at yjih@greenlinkanalytics.org by June 3.

4. Before the next session, Greenlink will provide you with projected 2030 indicators and maps for your city resulting from two scenarios—your selected “intervention” scenario and a “business-as-usual” scenario.

5. In preparation for the next session, examine the scenario outcomes and think about what they would mean for your community.
Session 3 – June 25, 3:30-5pm EST

Topics

• Interpreting scenario outcomes
• Evaluating and communicating scenarios
• Turning scenarios into equitable policies and actions

• Make sure the appointment is on your calendar
• Register in advance at https://wri.zoom.us/meeting/register/tJYtduqsqD4qHNUA
  EjjhukVuKfZLAGYP4WJg
Equitable Clean Energy Planning
Resource List

**Resource and Reading List**

Broadly Beneficial Clean Energy Planning

This list compiles tools, datasets, reports, frameworks, and other resources that should be useful to city governments engaging in inclusive clean-energy planning. The list is necessarily incomplete, but the gold-highlighted items are particularly recommended.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Provider</th>
<th>Category</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>City and County Energy Profiles</td>
<td>DOE</td>
<td>baseline</td>
<td>data</td>
<td>Modeled state- and county-level data for electricity and natural gas consumption, vehicle use, and emissions.</td>
</tr>
<tr>
<td>Energy Poverty and Equity Explorer</td>
<td>CUSP</td>
<td>baseline</td>
<td>data</td>
<td>Income, housing, demographic, and energy-burden data at neighborhood-scale for Canadian cities. Based on data from Statistics Canada.</td>
</tr>
<tr>
<td>H+T Affordability Index</td>
<td>Center for Neighborhood Technology</td>
<td>baseline</td>
<td>data</td>
<td>Affordability of housing and transportation at a variety of spatial scales, down to US Census block. Based on census housing-cost data and modeled transportation-cost data.</td>
</tr>
<tr>
<td>Low-Income Energy Affordability Data (LEAP)</td>
<td>DOE</td>
<td>baseline</td>
<td>data</td>
<td>Income, housing, and energy-expense data at US, state, county, city, and census-tract levels. Data from US Census Bureau and Energy Information Administration.</td>
</tr>
<tr>
<td>State and Local Energy Data (STATE)</td>
<td>DOE</td>
<td>baseline</td>
<td>data</td>
<td>City-level energy use (by sector), energy expense, and demographic and income data.</td>
</tr>
<tr>
<td>State and Local Planning for Energy (SLOPE)</td>
<td>NREL</td>
<td>baseline</td>
<td>data</td>
<td>Modeled energy-efficiency potential, renewable generation potential, electricity and natural gas consumption BAU projections, levelized cost of energy (LCOE) projections, and population projections on a variety of spatial scales. Models based on numerous government-derived datasets and models.</td>
</tr>
<tr>
<td>Cities Leading through Energy, Analysis and Planning (Cities-LEAP)</td>
<td>DOE</td>
<td>baseline</td>
<td>resource list</td>
<td>Guidance and modeled data supporting city adoption of clean-energy policies and programs.</td>
</tr>
<tr>
<td>Local Clean Energy Self-Score Tool</td>
<td>ACEEE</td>
<td>baseline</td>
<td>tool</td>
<td>Interactive tool for evaluating a community’s existing energy policies against the ACEEE’s 2019 City Clean Energy Scorecard.</td>
</tr>
</tbody>
</table>

Full list available [here](#).
See you in a few weeks!

Thanks to our partners:

And advisors, reviewers and researchers:

• Allison Ashcroft, Canadian Urban Sustainability Practitioners
• Julie Curti, Metropolitan Area Planning Council (Boston)
• Megan Day, National Renewable Energy Laboratory
• Alex Dane, Natalie Elwell & Devashree Saha, World Resources Institute
• Denise Fairchild, Emerald Cities Collaborative
• Anthony Giancatarino, Movement Strategy Innovation Center
• Rebecca Kiernan, City of Pittsburgh
• Samantha McDonald, Greenlink Analytics
Q&A & Additional Discussion